

CLAIMS

(x) 1. A method for fabricating a semiconductor device comprising the steps of:

5 distributing a nonmetal element in a region in the vicinity of a surface portion of a semiconductor layer;

depositing a metal film on said semiconductor layer; and

10 epitaxially growing a semiconductor-metal compound layer in the surface portion of said semiconductor layer by causing a reaction between an element included in said semiconductor layer and a metal included in said metal film through annealing carried out on said metal film.

2. The method for fabricating a semiconductor device of Claim 1,

15 wherein the step of distributing said nonmetal element includes the steps of:

forming a compound layer including a semiconductor element and said nonmetal element on said semiconductor layer;

20 distributing said nonmetal element included in said compound layer in the region in the vicinity of the surface portion of said semiconductor layer through recoil by irradiating said compound layer with a particle energy beam; and

25 removing said compound layer.

3. The method for fabricating a semiconductor device of
Claim 1,

wherein the step of distributing said nonmetal element
includes the steps of:

5 forming a compound layer including a
semiconductor element and said nonmetal element on said
semiconductor layer; and

10 distributing said nonmetal element included in
said compound layer in the region in the vicinity of the
surface portion of said semiconductor layer through recoil
and removing said compound layer by irradiating said compound
layer with a particle energy beam.

4. The method for fabricating a semiconductor device of
Claim 2 or 3,

15 wherein said semiconductor layer has a face-centered
cubic crystal structure,

said semiconductor-metal compound layer has a face-
centered cubic crystal structure, and

said compound layer is amorphous.

20 5. The method for fabricating a semiconductor device of
Claim 2 or 3,

wherein said particle energy beam includes a nonmetal
element.

25 6. The method for fabricating a semiconductor device of
Claim 1,

wherein said semiconductor layer has a face-centered cubic crystal structure, and

said semiconductor-metal compound layer has a face-centered cubic crystal structure.

5 7. The method for fabricating a semiconductor device of Claim 1,

wherein said semiconductor layer has a diamond or zinc blende crystal structure, and

10 said semiconductor-metal compound layer has a calcium fluoride crystal structure.

8. The method for fabricating a semiconductor device of Claim 1,

wherein said semiconductor layer is a silicon layer,
said nonmetal element is oxygen,

15 said metal film is a cobalt film, and

said semiconductor-metal compound layer is a cobalt silicide layer.

5h 02 > 9. The method for fabricating a semiconductor device of Claim 8,

20 wherein said oxygen has a concentration of 4×10^{14} through $4 \times 10^{15} \text{ cm}^{-2}$.

10. The method for fabricating a semiconductor device of Claim 8,

25 wherein the step of distributing said nonmetal element includes a step of forming a silicon oxide film on said

silicon layer and distributing oxygen included in said silicon oxide film in the region in the vicinity of the surface portion of said silicon layer by irradiating said silicon oxide film with the said particle energy beam.

51 B3 11. A method for fabricating a semiconductor device comprising the steps of:

forming a gate electrode on a semiconductor layer;

forming impurity layers on both sides of said gate electrode in said semiconductor layer;

10 distributing a nonmetal element in a region in the vicinity of a surface portion of said semiconductor layer;

depositing a metal film on said semiconductor layer;

and

15 epitaxially growing a semiconductor-metal compound layer in the surface portion of said semiconductor layer by causing a reaction between an element included in said semiconductor layer and a metal included in said metal film through annealing carried out on said metal film.

20 12. The method for fabricating a semiconductor device of Claim 11,

wherein the step of distributing said nonmetal element includes the steps of:

25 forming a compound layer including a semiconductor element and said nonmetal element on said semiconductor layer;

distributing said nonmetal element included in
said compound layer in the region in the vicinity of the
surface portion of said semiconductor layer through recoil by
irradiating said compound layer with a particle energy beam;

5 and

removing said compound layer.

13. The method for fabricating a semiconductor device
of Claim 11,

wherein said semiconductor layer is a silicon layer,

10 said nonmetal element is oxygen,

said metal film is a cobalt film, and

said semiconductor-metal compound layer is a cobalt
silicide layer.

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15 of Claim 13,

wherein said oxygen has a concentration of 4×10^{14}
through $4 \times 10^{15} \text{ cm}^{-2}$.

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